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From ESG Finance to Supply Chain Governability: Mechanistic Barriers and Corrective Pathways in Sustainable Corporate Supply Chains

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Abstract. Interest in Environmental, Social and Governance (ESG) finance has grown alongside the effort to decarbonize production networks, yet the translation from finance to governance remains uneven at the supply-chain level. This article asks why. Drawing on the literature, it examines four linked issues: information identification, financing incentives, green innovation absorption, and transmission across multi-tier supply chains. The bottleneck is not simply the amount of green or ESG-labelled capital available. It also lies in uneven disclosure, disagreement across ratings, product designs that fit single firms better than chain processes, large capability gaps between lead firms and SMEs, and the absence of reliable channels through which financial and governance signals can travel from one tier to another. On that basis, the article argues for three adjustments: ESG finance should be designed around concrete supply-chain activities, core firms should play a stronger coordinating role, and the information base should be improved through more consistent disclosure, more usable ratings, and better data-sharing arrangements. None of these steps are likely to work well without policy support, digital infrastructure, and people who can work across finance, ESG, and supply-chain management.

Keywords: ESG Finance, Sustainable Corporate Supply Chains, Green Innovation Absorption, Chain Transmission, Supply Chain Finance

1. Introduction

Green transition rarely stops at the boundary of the focal firm. Procurement choices, production routines, logistics systems, downstream sales, and even recycling practices all shape the sustainability profile of the chain as a whole. For that reason, the supply chain now has to be treated not only as an efficiency device but also as a site of governance, where environmental responsibility, organizational control, and information transparency are worked out together [1, 2]. Whether finance can identify and back genuinely sustainable activities across that wider setting matters for a simple reason: without chain-level support, green transition tends to remain local rather than systemic.

A large body of work already links ESG to firm-level performance. Li and Kim, for example, report a positive association between ESG practices and profitability, with stronger effects for larger firms [1]. Aydoğmuş, Gülay, and Ergun likewise find that ESG performance is related to both firm

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value and profitability [3]. These studies help explain why ESG now appears in discussions of valuation, financing cost, and corporate governance rather than being treated as a purely ethical add-on.

The argument becomes harder once the firm is no longer the only unit of analysis. Zeng, Li, and Zeng show that operational performance carries the greatest weight in green supply-chain evaluation, ahead of environmental performance, while profitability receives less weight [2]. That finding shifts attention away from ESG scores in the abstract and toward the day-to-day organization of the chain. Dai and Tang make a similar point when they argue that ESG measures will have limited practical force unless they are connected to end-to-end supply-chain management [4]. In a multi-tier chain, sustainability is negotiated through coordination problems, uneven data quality, and responsibilities that spill across organizational boundaries.

This is one reason finance has moved to the center of the discussion. Malik et al. show that sustainable supply-chain finance is associated with better financial performance, with ESG practices acting as a mediating channel [5]. Agrawal, Modgil, and Gupta also identify a growing overlap between ESG, supply-chain finance, and value-chain risk management [6]. Taken together, these studies suggest that ESG finance does more than relabel conventional credit. It can reshape how firms sort risk, distribute resources, and respond to sustainability pressures inside the chain.

Even so, literature also points to a stubborn gap between possibility and outcome. Mandatory ESG disclosure can affect supplier choice and supply-chain configuration under uneven regulatory conditions [7]. Li, Ren, Yang, and Xu further show that inconsistency across ESG ratings weakens the information environment of capital markets and reduces the incorporation of firm-specific information into prices [8]. Disclosure and ratings are therefore not peripheral reporting devices. They help determine whether financial actors can recognize chain-level sustainability signals in a way that is stable enough to matter.

Chinese evidence adds useful micro-level detail. Liu, Zhao, and Wei find that stronger ESG performance is associated with greater entry by green investors, with green innovation serving as an important mediating mechanism; the effect is more visible among non-state-owned firms, larger firms, and firms outside heavily polluting industries [9]. Wu and Li likewise show that digital transformation can improve ESG performance through green innovation, although environmental uncertainty weakens the effect [10]. These findings indicate that capital alone is rarely enough. ESG finance works only when firms can absorb the related requirements, convert them into organizational or technological change, and sustain that change in routine operations.

On that basis, this article uses literature review and normative analysis to examine a narrower question: why does ESG finance still struggle to become durable governance capacity in sustainable corporate supply chains? The discussion is organized around four linked dimensions: information identification, financing incentives, green innovation absorption, and chain transmission.

2. Mechanistic barriers to ESG finance in sustainable corporate supply chains

2.1. Information identification barriers

Information is the first stumbling block. Finance cannot support sustainable conduct unless it can tell what counts as such conduct, where in the chain it occurs, and how credible the supporting evidence is. In supply chains, that task is unusually difficult because firms sit at different tiers, disclose under different rules, and possess very different reporting capabilities.

Lu et al. show that mandatory ESG disclosure influences relocation decisions within supply chains, which means that disclosure rules do more than document conduct after the fact; they can

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alter chain organization itself [7]. Li et al. also find that disagreement across ESG ratings worsens the information environment in capital markets and weakens the pricing of firm-specific information [8]. When standards and ratings do not line up, the identification problem becomes immediate: financial institutions lose a dependable basis for deciding which activities are genuinely sustainable.

The difficulty deepens in multi-tier settings. Reporting scope is uneven, disclosure intervals differ, and verification is often weakest exactly where visibility is lowest. Rating divergence then adds another layer of uncertainty. Under these conditions, ESG finance is easily pulled toward the most visible firms rather than the most consequential points in the chain. What looks like a technical issue of disclosure is therefore a governance issue at the start of the mechanism.

2.2. Financing incentive barriers

Problems with incentive design appear next. The issue is not only that ESG-oriented finance remains limited in quantity. It is also that many products are still built around the standalone firm, even though sustainability risks inside supply chains are distributed across activities, tiers, and relationships.

Agrawal et al. note that research on ESG and supply-chain finance now overlaps more clearly than before, but instrument design and value-chain adaptation remain underdeveloped [6]. Malik et al. similarly show that the performance effects of sustainable supply-chain finance are stronger when ESG practices mediate the relationship [5]. The implication is straightforward: the question is not simply whether ESG-labelled instruments exist, but whether they match the needs of particular chain activities and risk profiles.

Zeng et al.'s findings sharpen the point. If operational performance carries the greatest weight in green supply-chain evaluation, many sustainability problems are unlikely to be captured by aggregate firm scores alone [2]. Procurement reliability, production upgrading, logistics quality, and resource use are process issues before they are rating issues. Financing tools that remain detached from those processes will often provide weak or poorly targeted incentives. In that sense, the mismatch is structural rather than merely quantitative.

2.3. Financing incentive barriers

Absorptive capacity forms a third barrier. Even when sustainability information is available and financing tools are in place, governance effects do not follow automatically. Firms still need the ability to interpret ESG requirements and turn them into managerial, organizational, or technological change. That ability is highly uneven across supply chains.

Li and Kim report stronger profitability effects of ESG practices among larger firms, while Aydoğmuş et al. show that the influence of ESG dimensions on firm value and profitability is not uniform [1,3]. These studies suggest that the capacity to respond to ESG pressure is not evenly distributed. Scale, governance quality, digital capability, and internal resources all shape whether firms can convert financial support into practical improvement.

Evidence from China points in the same direction. Liu et al. show that ESG performance attracts green investors more strongly among non-state-owned firms, larger firms, and firms outside heavily polluting sectors [9]. Wu and Li also find that digital transformation improves ESG performance through green innovation more strongly in larger firms [10]. Core firms and digitally capable firms are therefore better placed to turn ESG requirements into financing advantages and governance gains. Many SMEs are not simply reluctant; they are operating with thinner managerial capacity, weaker innovation capability, and higher disclosure costs.

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2.4. Chain transmission barriers

Transmission is the fourth barrier. Even where sustainability information is identifiable and firms are willing to respond, ESG finance still has to move through the chain in a form that affects procurement rules, supplier behavior, logistics practices, and broader sustainability outcomes. In practice, that transmission is often uneven and short-lived.

Dai and Tang argue that ESG should be integrated into end-to-end supply-chain management, which implies an important role for core firms as nodes through which expectations, standards, and resources move [4]. Yet such a transmission structure is frequently incomplete. Financial institutions often remain distant from operational realities; core firms may raise ESG expectations without consistently supporting suppliers; and lower-tier firms are asked to comply without reliable access to finance, information, or capability-building support.

The result is a familiar pattern: visibility improves near the top of the chain, while operational and environmental risks further downstream remain weakly governed. The key issue, then, is not whether ESG finance enters the supply chain in name, but whether it can travel through the chain in a stable and usable way.

3. Corrective pathways

The preceding discussion suggests that expanding the amount of ESG finance by itself will not solve the problem. Finance becomes governance only through a set of links, and several of those links are still fragile. Three corrective directions stand out in the literature and in the logic of the chain itself: products need to fit real supply-chain processes, coordination needs to be stronger around core firms, and the information base needs to become more coherent.

3.1. Reshaping ESG financial products around real chain-level needs

The first adjustment concerns product design. Zeng et al. argue that green supply-chain performance should be evaluated through a combination of environmental, operational, and financial indicators [2]. Malik et al. likewise show that ESG practices mediate the performance effects of supply-chain finance [5]. These findings imply that financing arrangements should be tied more closely to concrete activities—procurement, production, logistics, and recycling—rather than resting mainly on a firm's aggregate ESG label.

Seen from that angle, upstream green credit or commercial paper, midstream special-purpose bonds or industrial funds, and downstream tools such as factoring or warehouse-receipt financing are not just different products; they correspond to different points in the chain. Product optimization therefore means designing finance around process and use cases. The closer the fit between financial instruments and real chain activities, the more likely financing incentives are to support green procurement, production upgrading, logistics coordination, and circular resource use.

3.2. Strengthening core-firm-led chain coordination

Incentives alone, however, do not close the governance gap. Coordination remains necessary because finance has to move across organizational boundaries, and because firms differ sharply in their capacity to respond. This is why Dai and Tang's emphasis on end-to-end supply-chain management matters here [4]. If core firms are the main organizing hubs of the chain, they are also the most plausible nodes through which ESG requirements and supporting resources can be transmitted.

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Wu and Li's findings on digital transformation point in the same direction [10]. Better information flow and stronger green innovation capability can improve ESG performance, and this logic extends beyond the focal firm. When financial institutions, supply-chain platforms, and core firms share transaction, fulfillment, and disclosure data more effectively, some of the information asymmetry that blocks financing decisions can be reduced. Third-party participation can help as well, especially where interpretation of standards, data verification, or financing communication remains contested.

More importantly, coordination changes what smaller firms are able to do. In a more stable chain structure, lower-tier suppliers do not receive only capital; they may also gain access to standards, information, and capability-building support. That matters because the problem for many SMEs is not simple unwillingness. It is limited capacity to absorb ESG-oriented change. Stronger coordination, if it is sustained, can therefore improve both transmission and absorption at the same time.

3.3. Reinforcing the information base through unified disclosure and improved rating methodologies

Information remains the base layer of the whole mechanism. Lu et al. show that disclosure systems can reshape supply-chain configuration, while Li et al. show that rating divergence weakens the capital-market information environment [7, 8]. If disclosure standards remain fragmented and ratings remain difficult to compare, financial institutions will continue to struggle when evaluating sustainability performance beyond the focal firm.

Three institutional responses follow from that problem. Supply-chain ESG disclosure needs greater consistency in scope and interpretation. Rating methodologies need to become more transparent and more usable across sectors and tiers. And data-sharing platforms need to make transactions, operational, and sustainability information easier to read together rather than in isolation. None of these steps is sufficient on its own, but together they would give ESG finance a much stronger evidentiary base.

4. Enabling conditions

These adjustments do not take effect automatically. Their practical force depends on a set of enabling conditions that make implementation possible over time.

4.1. Policy coordination

Policy coordination is one such condition. Its role is not merely symbolic. It matters because disclosure rules, green-finance policies, and supply-chain governance requirements are often developed in parallel rather than in concert. Liu et al. argue that ESG system construction requires stronger governmental guidance, supervision, and investor protection [9]. Liu likewise stresses the importance of institutional coordination in low-carbon transformation driven by green-finance supply chains in e-commerce [11]. Without some alignment across these rule systems, product redesign, coordination, and information sharing are unlikely to become stable.

4.2. Digital infrastructure

Digital infrastructure is another condition, particularly because the mechanism discussed in this article is most vulnerable at the points of identification and transmission. Wu and Li show that

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digital transformation can improve ESG performance through green innovation [10]. In supply-chain settings, the relevance goes further: big data can connect transaction and operational records, blockchain can improve traceability, and digital platforms can lower the frictions involved in coordination and financing. In that sense, digital tools do not simply raise efficiency; they also provide part of the governance infrastructure.

4.3. Interdisciplinary talent

Talent is less visible than policy or technology, but it is equally foundational. The studies reviewed here speak to end-to-end supply-chain management, digital transformation and green innovation, and the informational consequences of rating methodologies [4, 8, 10]. Read together, they imply that the relevant capabilities cut across ESG analysis, finance, data handling, and supply-chain operations. There is therefore a practical need for interdisciplinary professionals who can move among these domains. At the same time, the literature still says little about how such talent should be trained, so any proposal on this point remains provisional.

5. Conclusion

This article examines a narrower question within the broader ESG debate: why does ESG finance still struggle to become durable governance capacity in sustainable corporate supply chains? Using evidence from the existing literature, it argues that the problem is best understood through four linked dimensions: information identification, financing incentives, green innovation absorption, and chain transmission.

The main point is not that ESG finance lacks relevance, nor that supply chains lie outside the reach of financial governance. The difficulty is that the translation from finance to governance remains fragile. Disclosure is uneven, ratings diverge, financial products often fit single firms better than chain processes, absorptive capacity is distributed very unevenly across firms, and stable transmission mechanisms are still underdeveloped. These barriers do not operate separately; they reinforce one another.

For that reason, the article points to three priorities: redesign financial products around concrete chain activities, strengthen coordination around core firms, and improve the information foundation through more consistent disclosure, more credible ratings, and better data-sharing arrangements. The underlying challenge is therefore not whether ESG-oriented finance exists in principle, but whether the mechanisms that connect finance to chain-level sustainability can be made governable in practice.

This article also has clear limits. It is based mainly on prior studies and uses a normative, interpretive mode of analysis. The existing literature still provides limited and sometimes inconsistent evidence on how specific ESG financial instruments work across industries and supply-chain structures. Future research would benefit from finer-grained industry samples and chain-level data that can test when, and under what institutional conditions, ESG finance actually changes supply-chain governance.

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